

MISSOURI. Conservationist

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Small Groups Make Big Changes in Conservation

“Never doubt that a small group of thoughtful, committed, citizens can change the world.
Indeed, it is the only thing that ever has.”
—Margaret Mead

I am often reminded of this quote when I think of conservation. When you consider the extraordinary natural resources that have been well-kept at the local, state, national, and international level, you recognize that their safeguarding generally started with a small group of determined individuals whose passion for the outdoors motivated them to rally and provide leadership for a cause.

Leadership is at the heart of Margaret Mead’s quote and it is in the heart of so many individuals and groups who drive and support conservation efforts today — farmers who take charge of their soil and water resources by implementing erosion control practices, outdoor writers and educators who use the outdoors and outdoor experiences to communicate about our human role in the environment, community groups who adopt streams and road rights-of-way to demonstrate their initiative and community pride, universities and government agencies who engage in conservation research and help direct best management practices, and individuals whose energy and passion simply motivates their friends and neighbors to adopt conservation-friendly practices.

This month’s issue contains an article about Missouri’s master naturalists. They represent just one of the small, thoughtful, committed citizen groups we have in Missouri who take regular action in hope of changing the world; I’m familiar with their work so I know they are making a difference. And you will, too. Just taking the *Missouri Conservationist* demonstrates your passion for Missouri’s conservation heritage and provides a testimony to others that you are committed to a conservation ethic. So I thank you, as one committed citizen to another, for helping us change the world.

—Jennifer Battson Warren, deputy director

Members of a Stream Team pick up trash along a Missouri waterway. For more information about Missouri Stream Team, visit mostreamteam.org.



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by Bill Graham, photographs by Noppadol Paothong

Comprehensive deer study will guide future management

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Cover: A doe near Eureka photographed
by Noppadol Paothong.

📷 800mm lens • f/5.6 • 1/50 sec • ISO 1600

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WHAT IS IT?

Our photographers have been busy exploring the intricacies of outdoor Missouri. See if you can guess this month's natural wonder. The answer is revealed on Page 8.



FISHING FOR A BADGE

I'm writing you because it is my final requirement for my last merit badge in order to obtain my Eagle Scout rank. I've been reading the *Missouri Conservationist* for the past seven years, and to this day, it is the only magazine I get excited to read. I was reading the July issue, specifically the article *Up a Lazy River* [Page 24], and thought what a perfect article to write about. Fishing is one of my passions, and stream fishing for smallies is by far the most fun to me. The author of the article does a fantastic job of putting the reader in the moment; it was as if I was right there with him. I've just recently begun kayak fishing, and I feel that it brings you much closer to nature. You can go where most boats can't, and with no engine noise, you can hear all the sounds of nature. Just sitting here writing this makes me want to go fishing. The article has me thinking that I would like to go on a float trip of my own now, but I might wait for it to cool off a bit.

Hayden Loughery, via email

MILKWEED METHOD

Norman Murray's method of starting milkweeds in pots in the winter works very well [*Homegrown Milkweeds*; January]. I started my seeds shortly after reading his article in January, and in April or May, I had more seedlings than I knew what to do with! I planted numerous seedlings at home and in my prairie project in Phelps County. I also gave a lot to friends and even sold some at local farmers markets. Thank you for a great article on an easy way to start milkweeds.

Bob Bader, Labadie

SWAMP MILKWEED

I'm 67 years old, and I've been subscribing since my early teens. Thank you so much for a great magazine for so long. I'd love to grow some swamp milkweed [September; Page 30] but suspect I'd have to go find some in the wild to get seeds.

Tom Moss, via email

Editors' Note: For information on where to purchase swamp milkweed seed and other varieties of milkweeds, visit grownative.org.

FERAL HOGS

Your September article *A Sounder Approach to Feral Hog Control* [Page 22] was excellent. Matt Hill and Mark McClain wrote a great article of what feral hogs really are, and the harm these invasive species do to Missouri's fish, wildlife, and environment. Great description of the modern traps being used by incorporating electronics. Hopefully this article will educate Missouri hunters who feel they are doing us a favor when they try to shoot a single feral hog.

Carl Combs, via email

LEARN AND SHARE

You did it again. We are always challenged to read the whole magazine. Right off with this edition, Pages 4 and 5 were words we do not usually see or use and will now get to because we used the internet to see what they were. The words were *atlatls* on Page 4 and *gynandromorph* on Page 5. We are so much smarter, and enjoying the rest of the magazine in the process. We love each edition

and end up sharing with people in the building we live in. Our days to be outdoors are fewer, but we can enjoy most of it from your good work in each issue.

John and Gaye Merchant, via email

CORRECTION

In *Keepers of the Karst* [August; Page 10], we failed to credit the following for their efforts to help Department staff clean up sinkholes on private land in Perry County: Bridgestone Tire Company Tires4ward Tire Recycling Program, the Missouri Speleological Survey and other local caving groups, Southeast Missouri State University Agriculture students, Wildlife Society Student Chapter members, Stream Team members, and local citizen volunteers. We regret the omission. Department staff depends on a wide range of partners to help complete karst habitat conservation projects throughout the state. The Department recognizes and appreciates all their efforts.

Reader Photo



STIRRING UP A HORNETS' NEST

Melissa Mayes of Montgomery City captured this photo of a bald-faced hornet nest in a tree in her neighbor's yard. She says her neighbor was not concerned about the nest at all. "She had mowed by it many times before she had actually noticed it." The nests of bald-faced hornets are made of wood pulp — literally paper. The wasps chew wood, mixing it with their saliva, and construct nests of several layers of horizontal comb enclosed by an outer envelope. Mayes said she loves all things outdoors, especially fishing, and loves to take nature photos.



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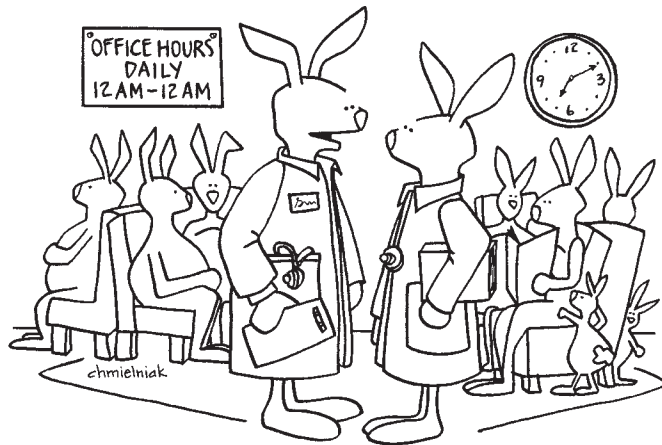
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"Nothing beats obstetrics for job security."

Agent Notes

Fall Turkey Hunting

WHEN MOST PEOPLE think about firearms turkey hunting, they think about early mornings, gobbles off the roost, and the first sounds of spring in the air.

Oct. 1 marks another opportunity for firearms hunters to harvest a turkey. Fall turkey hunting is somewhat of a forgotten season because many hunters are either archery deer hunting or preparing for the firearms deer season. Don't let October pass you by without participating in a challenging, yet rewarding, turkey season. The action may not be as fast-paced and intense, but if you are looking for an opportunity to enjoy the outdoors and another chance to harvest a turkey with a firearm, October is the month for you.

The fall season rules are different from spring season rules. Make sure the county you are hunting in has a fall firearms portion. Shooting hours are one-half hour before sunrise to sunset. Two turkeys of either sex may be harvested, and both may be taken on the same day. Fall firearms turkey season is Oct. 1–31, 2016.

Take advantage of this chance to get outdoors and enjoy another rewarding season in Missouri.



Travis Goreham is the conservation agent for Jackson County. If you would like to contact the agent for your county, phone your regional conservation office listed on Page 3.

HUNTING & FISHING CALENDAR

FISHING	OPEN	CLOSE
Black Bass		
Impounded waters and most streams north of the Missouri River	All year	None
Most streams south of the Missouri River	05/28/16	02/28/17
Bullfrogs and Green Frogs	06/30/16 at sunset	10/31/16
Nongame Fish Giggling		
Streams and Impounded Waters sunrise to midnight	09/15/16	01/31/17
Paddlefish on the Mississippi River	09/15/16	12/15/16
Trout Parks		
Catch-and-Keep	03/01/16	10/31/16
Catch-and-Release	11/11/16	02/13/17
HUNTING	OPEN	CLOSE
Bullfrogs and Green Frogs	06/30/16 at sunset	10/31/16
Coyote (restrictions apply during April, spring turkey season, and firearms deer season)	All year	None
Deer		
Archery	09/15/16 11/23/16	11/11/16 01/15/17
Firearms		
Early Youth Portion	10/29/16	10/30/16
November Portion	11/12/16	11/22/16
Late Youth Portion	11/25/16	11/27/16
Antlerless Portion (open areas only)	12/02/16	12/04/16
Alternative Methods Portion	12/24/16	01/03/17
Doves	09/01/16	11/29/16
Groundhog (woodchuck)	05/09/16	12/15/16
Pheasant		
Youth	10/29/16	10/30/16
Regular	11/01/16	01/15/17
Quail		
Youth	10/29/16	10/30/16
Regular	11/01/16	01/15/17
Rabbit	10/01/16	02/15/17
Sora and Virginia rails	09/01/16	11/09/16
Squirrel	05/28/16	02/15/17
Turkey		
Archery	09/15/16 11/23/16	11/11/16 01/15/17
Firearms		
Fall	10/01/16	10/31/16
Waterfowl	see the <i>Waterfowl Hunting Digest</i> or short.mdc.mo.gov/ZZx	
Wilson's (common) snipe	09/01/16	12/16/16
Woodcock	10/15/16	11/28/16

TRAPPING	OPEN	CLOSE
Beaver and Nutria	11/15/16	03/31/17
Other Furbearers	11/15/16	01/31/17
Otters and Muskrats	11/15/16	02/20/17
Rabbits	11/15/16	01/31/17

For complete information about seasons, limits, methods, and restrictions, consult the *Wildlife Code* and the current summaries of *Missouri Hunting and Trapping Regulations* and *Missouri Fishing Regulations*, *The Spring Turkey Hunting Regulations and Information*, *The Fall Deer and Turkey Hunting Regulations and Information*, the *Waterfowl Hunting Digest*, and the *Migratory Bird Hunting Digest*. For more information, visit short.mdc.mo.gov/ZZf or permit vendors.

Ask MDC

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Dark-eyed junco

I'm looking forward to seeing dark-eyed juncos once again. When can I expect them to arrive?

Juncos typically arrive from Canada and Alaska during the last week of October.

They breed in northern coniferous and mixed-coniferous forests, but they migrate south when temperatures turn cold. These ubiquitous, abundant birds form ground-foraging winter flocks. Commonly called "snowbirds," juncos are often found in suburbs, especially at feeders. They also congregate at the edges of parks, around farms, and near rural roadsides and streams. They prefer to eat seeds and arthropods, such as insects, spiders, millipedes, and crustaceans.

Juncos look a bit different from region to region, but two color variations are typical throughout Missouri during the winter. The most common is the slate-colored junco. It is light- to dark-gray all over, except for its belly and the two to three white outermost feathers on each side of the tail. The less common Oregon junco appears in the northernmost counties. Its back is a red-brown and its sides are rusty to pink. The brown sharply contrasts with the black or gray of the head and chest, giving the appearance of a hood.

If you see a sudden flash of white and dark tail feathers darting toward a bush, you may be seeing a junco.

Due to their regional differences,

juncos have been a bit of a taxonomic nightmare for scientists. As recently as the 1970s, dark-eyed juncos were split into five distinct species. They have subsequently been combined.

Although they are common, they are still beloved. Their arrival in early winter heralds the change of the season, and watching their energetic feeding takes the edge off chilly days.



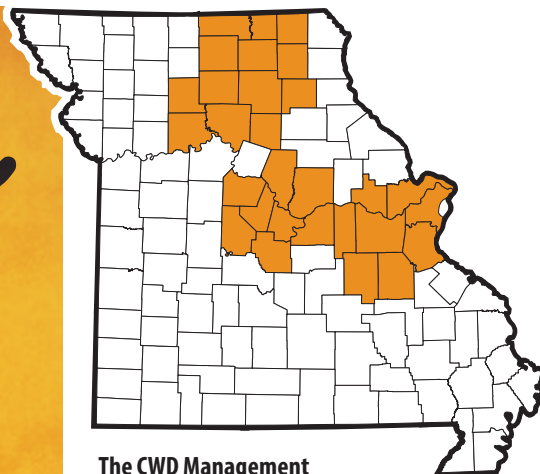
Bullfrog

Why is this bullfrog blue? We have lived here for 15 years and this is the first time we have seen this.

Two color pigments — blue and yellow — are needed to produce the normal green coloration of a frog. In a bluish animal, the yellow pigment is not present, possibly due to a mutation, thus giving the frog its unusual appearance.

However, it's also possible the frog has chytridiomycosis, an infectious disease caused by the amphibian chytrid fungus. By affecting the keratin layers of the skin, the fungus compels the frog to shed its skin more quickly in an effort to rid itself of the disease. The raised, loose skin can give the animal a blue-gray appearance.

Bullfrogs are found across the state of Missouri. They spend most of their time in aquatic habitats and are active from March to October. But don't expect to see them much longer. They begin hibernating around Halloween.



The CWD Management Zone includes 29 counties.

Department Needs Hunters' Help for CWD Sampling Firearms Opening Weekend

Chronic wasting disease (CWD) is a deadly deer disease that has been found in northeast, central, and east-central Missouri. To find and limit the spread of CWD, the Missouri Department of Conservation needs the help of hunters.

Hunters who harvest deer during the opening weekend of the fall firearms deer season (Nov. 12 and 13) in any of the 29

counties of the Department's CWD Management Zone are required to present their deer for CWD sample collection on the day of harvest at one of 75 sampling locations. Hunters also have the option of presenting just the deer head with about 6 inches of neck attached. Sampling locations will be open from 7:30 a.m. through 8 p.m.

The 29 counties of the CWD Management Zone are Adair, Boone, Callaway, Carroll, Chariton, Cole, Cooper, Crawford, Franklin, Gasconade, Jefferson, Knox, Linn, Livingston, Macon, Miller, Moniteau, Morgan, Osage, Putnam, Randolph, St. Charles, St. Louis, Schuyler, Scotland, Shelby, Sullivan, Warren, and Washington.

CWD sampling involves collecting tissue samples from the necks of harvested deer. Hunters can get free test results after samples are processed.

Hunters can help reduce their wait times at CWD sampling locations by:

- Telechecking their deer before going to a sampling location,
- Having their completed permit information ready,
- Positioning their deer in the vehicle so the head is easily accessible for staff to take tissue samples from the neck, or
- Having the detached head and neck bagged and ready.

Get a map of the 29 CWD Management Zone counties, a list of the 75 CWD sampling locations, and sampling instructions online at mdc.mo.gov/CWD and in the *2016 Fall Deer & Turkey Hunting Regulations and Information* booklet, available where hunting permits are sold.

Out of State Harvests

The Department reminds hunters who harvest deer, elk, or moose outside of the state and bring the animal back to Missouri that they must report the animal's entry into the state within 24 hours

by calling 877-853-5665 or reporting it online at mdc.mo.gov/carcass. Reporting is required by law. The carcass must be taken to a licensed meat processor or taxidermist within 72 hours of entry.

Hunters just passing through Missouri on their way to another state are exempt from this requirement as long as they are not in Missouri for longer than 24 hours.

The reporting requirement is only for whole carcasses and carcasses that have the head and spinal column attached. Parts that do not require reporting and that are at low risk for harboring CWD include: meat that is cut and wrapped, boned-out-meat, quarters or other portions of meat with no parts of the spine or head attached, hides or capes from which excess tissue has been removed, antlers, including those attached to skull plates or skulls where all muscle and brain tissue has been removed.

Learn About CWD at Oct. 13 Wild Webcast

Join Conservation Department experts on Thursday, Oct. 13, from 6–7 p.m. to get information and ask questions about chronic wasting disease (CWD) in Missouri. Participate through the convenience of a computer or mobile device. The online conversation will include a brief presentation on Department efforts to limit the spread of the deadly deer disease and what hunters, landowners, and others can do to help.

For more information or to register, visit bit.ly/2bsJt3M.

Get Hunting Prospects for Small Game

The Department's *Small Game Hunting Prospects* blends small-game population research and management with hunting tips in one convenient guide. Sections include profiles of popular small game species, managers' notes from quail emphasis areas across the state, and tips and tricks for small game hunters. The information also highlights conservation areas where various species are found.

Get the guide at short.mdc.mo.gov/Zon. For hunting information by species, visit short.mdc.mo.gov/ZZn, and get hunting prospect information under the *Getting Started* section for each species.

Fall Hunting Opens for Rabbits, Game Birds, Deer, and Waterfowl

October marks the opening of firearms season for rabbits and wild turkey, along with youth week-ends for deer, quail, and pheasant. Hunters can also pursue woodcocks beginning mid-month. Waterfowl season opens for Canada geese and brant Oct. 1, followed by waterfowl youth hunting in the North and Middle zones Oct. 22–23, and ducks and coots in the North Zone starting Oct. 29.

For detailed hunting information by species — along with places to hunt, recipes, and more — visit huntfish.mdc.mo.gov. Information is also available through the Department's hunting booklets, available where permits are sold and online at short.mdc.mo.gov/ZZf. Hunting permits are available online at mdc.mo.gov/buypermits.

Auction Set for Oct. 15

The Department will hold a public auction Saturday, Oct. 15, starting at 10 a.m. at its Salem Maintenance Center, located at the junction of



Rabbit hunting season runs Oct. 1 through Feb. 15, 2017.

Highway 72 and Highway 32. The auction will include boats, outboard motors, tractors, trailers, farm equipment, and vehicles.

View auction items Friday, Oct. 14, from 8 a.m. to 5 p.m., with auction preregistration starting at 9 a.m. Registration the day of the sale begins at 7:30 a.m. A complete lot listing and terms of sales will be available at the registration desk the day of the auction.



CONSERVATION COMMISSION ACTIONS

The August Commission meeting featured presentations and discussions regarding the Black Bear Project, 2016 mandatory CWD sampling, permit suspensions for *Wildlife Code* violations, communications update, the Discover Nature Schools program, major construction projects, information technology projects, and the financial report. A summary of actions taken during the Aug. 25–26 meeting for the benefit and protection of fish, forests, and wildlife, and the citizens who enjoy them includes:

- » **Recognized** Department staff members who have received recent national awards.
- » **Received** comments on proposed regulations regarding smallmouth bass from Troy McAfee, Current River Smallmouth Association, Winona.
- » **Approved** regulations related to smallmouth bass and rock bass and changes to the *Wildlife Code* identified during the mid-year review.
- » **Gave** authorization to enter into a contract with Spencer Contracting Company of Arnold, Missouri, for construction of the Statewide Tower Replacement Project at various conservation areas and in various counties.
- » **Approved** the purchase of 133.29 acres in Knox County as an addition to Henry Sever Lake Conservation Area.

The next Conservation Commission meeting is Oct. 20–21. For more information, visit short.mdc.mo.gov/ZZe or call your regional Conservation office (phone numbers on Page 3).

[NEWS & EVENTS]

(continued from Page 7)

Cash, check, and credit/debit cards will be accepted. As required by state statute, the Department must charge a processing fee to all customers who pay by credit or debit card.

For more information, including a list of auction items and procedures, visit mdc.mo.gov/auction.

Deer and Turkey Regulation Changes for Fall

The Department reminds deer and turkey hunters of regulation changes that go into effect this fall.

To offer youth additional hunting opportunities, the Department has expanded the late youth portion of the fall firearms deer season from two to three days and moved it earlier in the season. It will now start on the first Friday after Thanksgiving instead of early January.

The Department has reduced the length of the antlerless portion of the fall firearms deer season from 12 to three days, and it now begins on the first Friday in December.

Due to low harvest numbers, the Department has eliminated the urban portion of the firearms deer season and moved the areas under

statewide regulations.

Crossbows have been added as a legal method during the archery deer and turkey season and also during the fall firearms turkey season. As a result, the Department has removed the hunting method exemption requirement. The regulation change will provide additional hunting opportunities for young hunters and help prolong hunting activities for older participants.

To help protect young bucks and increase the number of mature bucks, the bag limit of antlered deer has been reduced from three to two during the combined archery and firearms deer hunting season. No more than one antlered deer may be taken during the firearms deer hunting season and only one antlered deer may be taken prior to the November portion of firearms season.

Get more information on fall deer and turkey hunting in the *2016 Fall Deer & Turkey Hunting Regulations and Information* booklet, available where hunting permits are sold and online at short.mdc.mo.gov/ZZf.

Buy Permits Through MO Fishing

The Conservation Department announced a name change and new features to its free mobile fishing app, Find MO Fish. With the updated app, now called MO Fishing, users can:

- Buy, save, and show permits right from their mobile devices.
- Access a database of more than 950 public places to fish.
- See what selected bodies of water offer, such as boat ramps, docks, parking lots, fish-attractor structures, restrooms, and other amenities.
- View detailed maps of more than 4,000 fish-attractor locations for selected bodies of water.
- Read annual fishing prospects and weekly fishing reports for many bodies of water.
- Use the app's fish guide to help identify the catch of the day.
- Get information on fishing regulations, seasons, catch limits, and more.

Download MO Fishing through Google Play



WHAT IS IT?

Marbled Orb Weaver | *Araneus marmoreus*

The marbled orb weaver is a colorful spider whose wide range includes all of the eastern United States. It's sometimes called "pumpkin spider" because the rounded abdomen of this species can be bright orange. The pattern is variable, and the color can be white, yellow, or orange, with mottling and spotting of black, brown, or purple. Females build their wheel-shaped webs among trees and tall weeds in moist woods, often near streams.

—photograph by Noppadol Paothong

for Android devices or the App Store for Apple devices. For more information on MO Fishing, visit short.mdc.mo.gov/Zoh.

Tom Martin Named State Logger of the Year

Congratulations to Tom Martin of Birch Tree on being named Missouri's State Logger of the Year. Martin was also named Regional Logger of the Year for the Ozarks. He has been a contract logger for Smith Flooring for almost a quarter century and has worked on private, state, and federal land timber sales across the Ozarks.

In recognition of his award, Martin received a framed print from the Department and a new Stihl chainsaw from Crader Distributing at the Missouri Forest Products Association summer meeting.

The Missouri Department of Conservation gives annual awards to loggers who have demonstrated good working relationships with landowners and foresters. The loggers are recognized for minimizing damage to trees and natural resources and using best management techniques that preserve Missouri's forested lands for generations to come. For more information, visit short.mdc.mo.gov/Zoi.

Fall Colors on Display During Annual Poosey Driving Tour

The Missouri Department of Conservation invites nature lovers to its 30th annual fall driving tour at the Poosey Conservation Area in northwest Livingston County on Oct. 16. Visitors can enjoy the autumn colors of rugged hills and forests as they drive on roads not normally open to vehicles. The Department will have exhibits and conservation displays along the route. Gates will open at noon and the last vehicle will be allowed to begin the driving tour at 4 p.m. All roads are



Indian Creek Lake on Poosey Conservation Area

graded and graveled; however, some sections of the tour route involve steep slopes and crossings in low areas. Four-wheel-drive and high-clearance vehicles are recommended. Visitors should allow time for stops to enjoy scenery and discussions at exhibit areas.

For more information, call 660-646-6122. For maps and more information about Poosey Conservation Area, visit short.mdc.mo.gov/Zo5.

Sites Added to Great Missouri Birding Trail Website

Discover nature by exploring the best places to birdwatch around Missouri. Find them through a new website, Great Missouri Birding Trail, at greatmissouribirdingtrail.com. The website

includes an interactive map of the best birding sites around the Show-Me State, along with information on various aspects of bird conservation for the new and seasoned birder. Pages include beginner basics, birding tips, landscaping for birds, and ways to get involved with local birding organizations.

Central and southeast portions of the trail have recently been added. Other completed sites are St. Louis and Kansas City. Work continues on northeast and southwest portions.

The Great Missouri Birding Trail is a partnership between the Missouri Bird Conservation Foundation and the Department, with support from other state and federal agencies and birding organizations.

DID YOU KNOW?

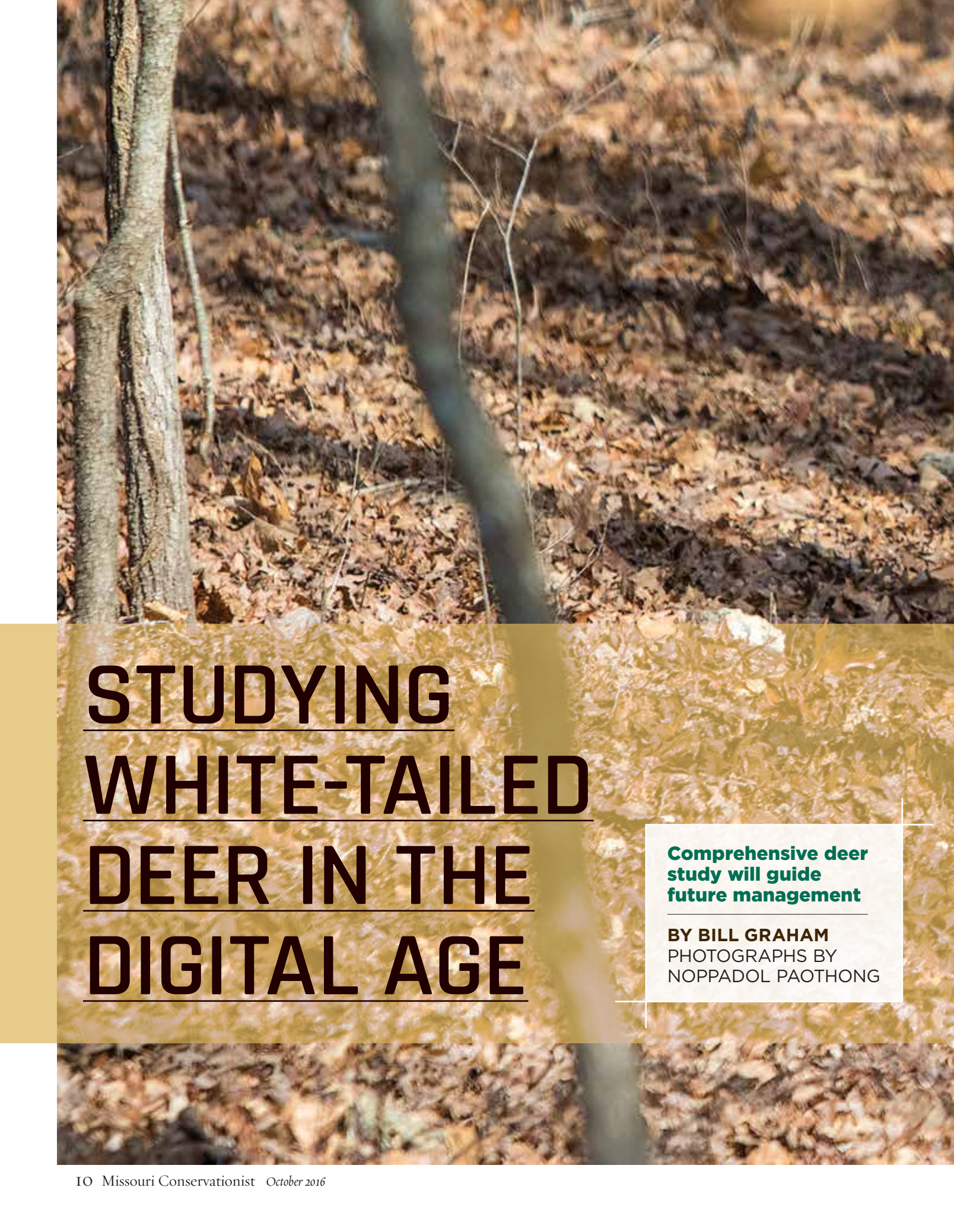
We work with you and for you to sustain healthy fish, forests, and wildlife.

State Forest Nursery Helps You Help Habitat

Since 1947, the George O. White State Forest Nursery near Licking has offered Missouri residents seedlings for reforestation, windbreaks, erosion control, and wildlife habitat.

- » The original nursery property was 40 acres and had about **15 acres of seedbeds**.
- » Today, the total acreage of the nursery is 754 acres, with **50 acres of seedbeds**.
- » The nursery now grows **more than 70 different species** of trees and shrubs.
- » Except for a few pine species, all are **native Missouri plants**.
- » To grow all these seedlings, the nursery collects or buys approximately **100,000 pounds of seeds** each summer and fall.
- » For example, about **2,000 bushels of walnuts** (50,000 pounds), **7,000 pounds of white oak acorns**, **3,000 pounds of hazelnuts**, and **3,500 pounds of plum seed** are needed just to establish seedlings for these four species.
- » Each year the nursery processes more than 10,000 orders and **ships about 3 million seedlings**.
- » The nursery accepts seedling **orders online between Oct. 1 and April 15** every year. The printed *Seedling Order Form* appears in the November *Conservationist*.

To learn more about the nursery, browse planning and planting resources, and order conservation seedlings for your yard or farm, visit mdc.mo.gov/seedlings.



STUDYING WHITE-TAILED DEER IN THE DIGITAL AGE

**Comprehensive deer
study will guide
future management**

BY BILL GRAHAM
PHOTOGRAPHS BY
NOPPADOL PAOTHONG



A white-tailed doe wears a battery-powered GPS collar that will transmit the deer's location to research biologists every five hours.



A research biologist uses radio telemetry to track fawns outfitted with expandable radio collars.

Only hours old, a fawn curiously peered upward as people approached. Hands pulled the grass back from the fawn's hiding place on this spring day, its mother likely watching somewhere beyond the woodland's shady edge. A radio collar that researchers placed on the doe the winter prior transmitted a signal to a satellite in space, which relayed the doe's location to a computer, enabling the biologists to search the general area and find the fawn hidden in the grass. Now, the fawn will also be followed via radio telemetry in a broad study to keep Missouri's deer herd healthy.



Biologists from the Missouri Department of Conservation and the University of Missouri–Columbia (MU) are using high-tech gear to peer into the daily world of white-tailed deer. They're two years into a five-year study of deer reproduction, movement, and mortality. One study area is in north Missouri farm country, while another is in the timbered hills of the southern Ozarks. Those areas represent much of the state's ecology. The project is funded with assistance from Federal Aid in Wildlife Restoration Funds.

"By the end of this study, these data will give us a very clear indication of what deer are doing in Missouri," said Jon McRoberts, an MU research scientist and project coordinator.

A History of Research

The Department has always tracked the state's deer herd with studies and harvest data. Science-based conservation helped whitetails rebound from the state's low in the 1920s of 400 deer in the Ozarks. Now, deer are enjoyed statewide by both wildlife watchers and hunters. Deer hunting is a tradition valued by families, and it pumps more than \$1 billion annually into Missouri's economy.

The state's most recent detailed deer studies were conducted in the 1980s and 1990s. Since then, new technology, such as GPS collars, makes monitoring deer movement more accurate. Also, deer habitat has changed in some regions, said Barbara Keller, Department resource scientist. Deer populations are down in some areas due to habitat changes, harvest, or disease. However, in other areas deer numbers are on the upswing.

"We need to update our deer survival and reproduction research and plug that information into a new population

model,” Keller said. “We’re also looking at deer habitat use and their movements, which could affect disease management. We’re learning how deer use the landscape in different areas of Missouri.”

The Five-Year Study

As part of the five-year study, researchers are trapping and monitoring deer in portions of Nodaway, Gentry, Andrew, and DeKalb counties in northwest Missouri where crop farming is prominent. Timber and cattle are produced in the study area of the Ozarks that includes parts of Douglas, Howell, Texas, and Wright counties. Farmers are key partners because most of the study is conducted on private land.

“We appreciate the cooperation of the landowners,” said Vance Vanderwerken, the northwest MU research team leader. “We have 120 landowners assisting in our area this year and last.”

In the Ozarks, more than 150 landowners have cooperated with the team’s trapping, searching for fawns, and recovering mortalities, said Ozark team leader Billy Dooling.

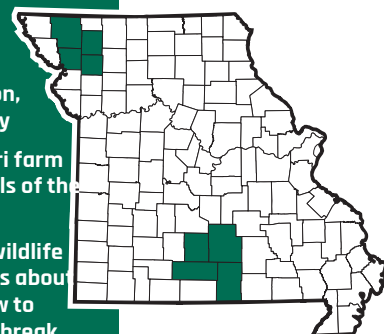
The study could not happen without these landowners providing access for trapping and monitoring deer, Keller said.

“People are interested in the study,” Keller said, “and we’re very fortunate they are.”

Research teams trapped deer early in 2015 and this January into March. Summer began with 177 adult deer being tracked via the GPS collars and computers.

THE FIVE-YEAR STUDY 2014-2019

- Studies deer reproduction, movement, and mortality
- Focused in north Missouri farm country and timbered hills of the southern Ozarks
- Data collected will help wildlife biologists make decisions about hunting seasons and how to respond to a disease outbreak



To Catch a Deer

Teams use traps or rocket nets to catch deer. The traps are small pens made with metal frames and woven net. Deer can enter but cannot leave. Team members quietly approach the trap, pull some pins, and collapse the netting on the deer. They subdue the animal and take measurements such as neck size, hind foot length, eye-to-nose distance, and chest girth. Blood samples are also taken and later frozen for possible future research studies.

A battery-powered GPS collar is placed on the neck of each adult deer. Every five hours, the collar takes a reading



Expandable fawn collars grow with the fawn and allow tracking for up to a year. Weight, body measurements and condition, and gender are recorded.



by satellite of the deer's location. That data is transmitted at four-day intervals and stored on computers.

Female deer receive extra attention during the trapping. Crews use an ultrasound unit to tell if a doe is pregnant. A blood sample is also taken as backup. If the doe is pregnant, a vaginal implant transmitter (VIT) is inserted. This transmitter sends a radio signal that crew members can pick up with a receiver.

In May and June, when fawns are due, the GPS units on does begin to take readings once an hour and transmit them twice a day to a computer. Biologists watch the GPS readings on a computer, and they know when a doe stays in one spot she is ready to give birth. After a fawn is born, the VIT is pushed out and temperature change causes its radio signal to change. Teams follow the signal to the birth site. From there, team members fan out and search for the fawn. It's often hot, sweaty work pushing through thick brush or tall grass, but their reward is finding a tawny miracle with white spots, too new to the world to be afraid.

The Search for a Fawn

"Fawn," shouted Jacob Peterson, an MU research technician, walking fields in a search line last May.

Team members gathered around the fawn's hiding spot in a brushy draw. The doe had hidden it near a small creek that wound through fields in northwest Missouri. They



Crew members record measurements and take blood samples from a doe for the study's data base. A cloth is placed over the animals face to keep it calm. Biologists do an ultrasound to check if the doe is pregnant. A battery-powered GPS collar is placed on its neck before it is released back to the wild.



Research biologists set up small pens that catch deer.

placed a cloth over the fawn's eyes to keep it calm during measurements. The tiny deer weighed almost 8 pounds. A small, expandable radio collar was placed around its neck. Technicians track collared fawns daily to determine if they survive hazards, such as bad weather and predators. Forty fawns in each study area were collared this year.

"It's very important to know our fawn survival rate," Keller said. "That's one of the most variable factors within deer populations. Adult deer survival rates are fairly stable. Fawn survival and reproduction are always the most variable."





Mortality data is useful for this study. Crews sometimes find dead fawns, and adult deer with GPS collars are often located after they've been killed by predators or by accident. Hunters are encouraged to harvest deer with GPS collars if that deer is one they would normally take by legal hunting methods. Hunters killed 15 collared deer during the 2015–2016 hunting season. One was taken with a bow and the others with firearms.

"Harvest season went well," McRoberts said. "Hunters were cooperative and interested."

On the Move

A few deer in the study have surprised researchers. Most deer stay within a small territory, rarely traveling more than a mile or two or less. But some deer make cross-country treks. Dooling said one yearling buck in the Ozarks was harvested by a hunter 14 miles from where it was trapped.

"We've seen one doe in northwest Missouri that moved more than 15 miles in a week or two and then came back almost where she started," McRoberts said. "We can't say

A collared doe
is released back
into the Ozarks.

why she did it, but to have those kind of data is quite interesting. We were somewhat surprised at how quickly she did it."

The Goal of the Study

A vast amount of deer data is being gathered, stored, and analyzed. This information will be used in the years to come, along with harvest numbers, to gauge deer numbers in local areas and to forecast future trends. When summer began, the GPS collars had already provided 350,000 data points.

The overall goal of the study is a healthy deer herd in balance with nature and people. Data from the entire study will help wildlife biologists make decisions about hunting seasons and how to respond to a disease outbreak, such as chronic wasting disease.

"It's really a great project," McRoberts said. "Landowners text me weekly asking, 'what's new.'" ▲

Bill Graham is a media specialist for the Kansas City and Northwest regions who lives near Platte City. He's a lifelong hunter, angler, and camper who also greatly enjoys hiking and photography.



A LASTING *Legacy*

BY HEATHER FEELER

**Master naturalist volunteers in
Missouri give back in big ways**



KATHY FAYANT, A MASTER NATURALIST with the Lake of the Ozarks Chapter in Camdenton, paddles her kayak ahead of me, using her paddle to point out areas of interest along the Big Niangua River Trail. Turtles sun themselves on every log, and blue herons call in the distance. It's a perfect day on the water, and I can almost hear American naturalist John Muir's voice:

"When one tugs at a single thing in nature, he finds it attached to the rest of the world."

It is this connection with nature, and the hard work by people to make it a lasting legacy, that makes the mission of the Missouri Master Naturalist Program a vital one. The program's mission is to engage Missourians in the stewardship of the state's natural resources through science-based education and community service. It's a group of like-minded, adult volunteers tugging away at these community conservation projects and coming together for a bigger purpose — to protect and promote our natural resources in Missouri. They do it in a big way.

The Master Naturalist Program, created in 2004, is a partnership between the Missouri Department of Conservation and the University of Missouri Extension. There are 12 Master Naturalist chapters around the state, each becoming their own volunteer family and working on a variety of projects in their respective communities.

"People volunteer for this program because of the variety of activities where they can do individual projects and work with a group," said Syd Hime, volunteer and interpretive programs coordinator with the Conservation Department. "They do such cool things, and we've learned that chapters build a social network among themselves."



Kayakers paddle along 13.3 miles of the Big Niangua River Trail near Lake of the Ozarks.

A Labor of Love

The 13.3-mile water trail starts at Ha Ha Tonka State Park and flows through 20 marked interpretive spots (A through T), including natural springs, wetlands, and caves. This unique water trail was made possible by the work of the Master Naturalist Program and other key partners such as the Conservation Department, Missouri State Parks, Ameren Missouri, and the Lake of the Ozarks Watershed Alliance.

The project was a labor of love. In addition to community partnerships, the Lake of the Ozarks Chapter Master Naturalist team, led by Fayant, had to get permission from private landowners along the trail, develop a trail brochure, and mark all the interpretive sites with signage, including many way up in trees. It took everyone's time and talent, including the unique gifts of one limber fisheries biologist.

"It was exciting seeing all the groups come together and people with different talents sharing those skills and interests," said Greg Stoner, fisheries biologist with the Department. "My role was helping with the brochure and getting the signs up along the trail. I was the only one good at shimmying up trees."



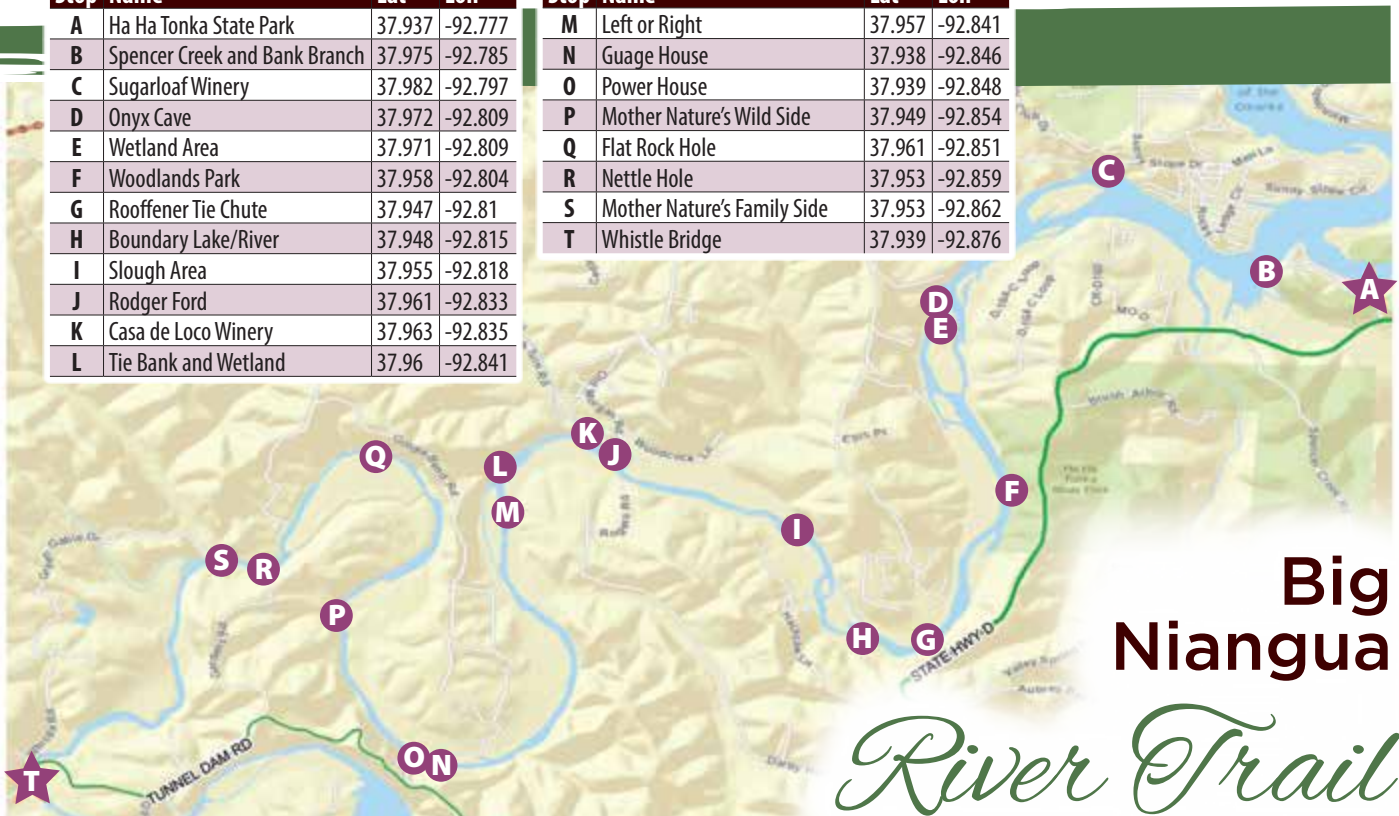
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Missouri Master Naturalist



Stop	Name	Lat	Lon
A	Ha Ha Tonka State Park	37.937	-92.777
B	Spencer Creek and Bank Branch	37.975	-92.785
C	Sugarloaf Winery	37.982	-92.797
D	Onyx Cave	37.972	-92.809
E	Wetland Area	37.971	-92.809
F	Woodlands Park	37.958	-92.804
G	Rooffener Tie Chute	37.947	-92.81
H	Boundary Lake/River	37.948	-92.815
I	Slough Area	37.955	-92.818
J	Rodger Ford	37.961	-92.833
K	Casa de Loco Winery	37.963	-92.835
L	Tie Bank and Wetland	37.96	-92.841

Stop	Name	Lat	Lon
M	Left or Right	37.957	-92.841
N	Guage House	37.938	-92.846
O	Power House	37.939	-92.848
P	Mother Nature's Wild Side	37.949	-92.854
Q	Flat Rock Hole	37.961	-92.851
R	Nettle Hole	37.953	-92.859
S	Mother Nature's Family Side	37.953	-92.862
T	Whistle Bridge	37.939	-92.876



Big Niangua River Trail



Master naturalists with the Confluence Chapter in the outdoor Nature Explore Classroom in Towne Park.

The trail opened last year with more than 100 people at the grand opening. Many of the chapter volunteers, now active kayakers, also started a monthly kayak meet-up event on the second Saturday of each month to go out on the trail together. All are welcome.

“It’s a unique and different outdoor experience than most have had at Lake of the Ozarks. It’s a quieter activity and a way to get close to nature in a beautiful setting,” said Fayant. “The purpose of the trail is to get people out in nature, so they’ll appreciate and hopefully conserve it.”

Nature’s Classroom

Getting people out in nature is the goal of many Master Naturalist chapters, including the Confluence Chapter in St. Charles. In partnership with the St. Charles County Parks Department, the Confluence Chapter built a Nature Explore Classroom in Towne Park to create a place for outreach programs for youth. Gary Schneider, a master naturalist since 2006, and Joe Walker took the lead on building the outdoor classroom.

“We stepped in as master naturalists to coordinate and build 11 different areas. On a good day, we had eight to 10 people working out there, including help from local high

school students,” said Schneider.

While Schneider’s strength is construction, Connie Campbell, a retired schoolteacher and also a master naturalist, volunteers to assist the masses of school kids now flocking to the area for field trips. Campbell helps the kids with the different outdoor learning stations, including fishing at the pond, balancing activities, singing and dancing on the musical stage area, and pedaling on a bicycle to pump water to and from the lake.

“This classroom was designed for kids to use the stations for free play and their own imagination. I love to see the delight on their faces and how engrossed they get in it,” said Campbell. “So much of entertainment is video games and on the computer. Kids don’t get outside. It’s important to bond with nature.”

In the last two years, more than 1,800 kids from the St. Charles County area have come to play at the park, built by the hands of volunteers hoping to make a lasting impression.

“Being a master naturalist has helped me realize we should try and preserve nature. This is the only planet we have. We can’t mess it up. We must protect it. It’s time for us to give back,” reflects Schneider.

Making Science Happen

When Marge Lumpe moved back to Missouri after living in Texas for 41 years, she was eager to find a conservation-minded group like many of those she was part of in Texas. When she heard Hi Lonesome Master Naturalist Chapter was starting in Cole Camp in 2008, she jumped at the chance to be part of the first training class with 25 other people in the area.

“After moving back, I was a little desperate to connect with conservation here in Missouri,” admits Lumpe. “When they started a Master Naturalist chapter, I was ecstatic!”

With the Drovers Prairie Conservation Area being close by, which has 80 acres of remnant prairie and has been designated by Audubon Missouri as an important bird area, Lumpe, a lifetime birder, helped start one of the chapter’s biggest annual projects — the Christmas Bird Count. This annual bird count is the nation’s longest running citizen-science bird project, and data collected by participants provides a wealth of information to researchers doing long-term studies of early winter bird populations across North America.

In addition to bird counts, the chapter also helps with frog and toad surveys, as well as taking advantage of unique opportunities, such as trapping greater prairie chickens in Kansas. It’s that life-long learning, plus

By the Numbers — Missouri Master Naturalist

- To become a certified Missouri master naturalist, volunteers complete a 40-hour training course covering Missouri natural history, wildlife management, and natural resource interpretation.
- Volunteers contribute an additional 40 hours of conservation-related volunteer service each year, including additional hours of ongoing education, to retain their certification.
- Through the 12 chapters, 1,855 volunteers have been trained as master naturalists since the program started in 2004.
- During 2015, volunteers provided 64,157 hours of community service with an economic impact valued at \$1.6 million.
- More than 387,000 hours of volunteer service have been provided to local communities since 2004, with a cumulative economic impact of \$8.3 million.



the opportunity to help others learn more about conservation, that keeps Lumpe excited about being a master naturalist.

“It’s a fun thing for people who want to learn all their life. You can follow your bliss,” said Lumpe.

Building Healthy Communities

Highways leading into major metropolitan cities are more likely to be lined with asphalt than beautiful butterfly gardens. The Osage Trails Master Naturalist Chapter in Kansas City is hoping to change that.

Mary Nemecek, who was part of the 2009 Master Naturalist class, helped start a butterfly garden along the highway in Parkville in the spring of 2015. Through a grant from the Platte Land Trust, the team put in two small gardens, both totaling 2,100 square feet, planted 20 feet apart. Master naturalists put in the garden, and they meet regularly for work days for ongoing maintenance. Community members are also invited to help. The most surprising part of the project for Nemecek was how quickly the community embraced the project.

“We put this garden in and people started claiming it as their own. Stuff just started showing up in the garden like garden art. People even honk when we’re working out there,” laughs Nemecek.

Perhaps even more exciting than the garden art and neighborly honking, was the



Hi Lonesome Master Naturalist Chapter counting birds for the Christmas Bird Count near Cole Camp.

appearance of the visitors they hoped would arrive in their highway garden — monarchs. These iconic butterflies are found in a wide variety of habitats throughout their annual migrations to and from Mexico. Unfortunately, habitat loss and other factors are causing a decline in this species. Missourians are encouraged to plant milkweeds for the larvae and other native flowers that supply the nectar for adults. It is a success story Nemecek hopes to be part of as a master naturalist.

“I believe our future is really dependent on bringing native plants back into our urban areas,” said Nemecek. “I think the key is to put them back in places where people can see them every day and say, ‘gosh, look at all those butterflies’ and then want to put them back in their yards.”

Getting people’s attention about nature, especially those driving down the highway, is also the goal of the Loess Hills Chapter in St. Joseph. The chapter set out with an ambitious six-year goal — plant trees along Highway 36 all the way from St. Joseph to Hannibal. More than 50 years ago, native trees had lined the highway, but making room for a four-lane highway meant many of those trees were removed.

“Highways are getting sterile. Driving along a scenic highway is not an event anymore. We wanted to bring back that scenic driving experience with trees and signs to help people know more about the trees,” said TJ Peacher, outreach and education district supervisor with the Department.

Phase one of the project started in 2014 with the planting of 160 native trees every 5 miles from St. Joseph to Cameron.



Osage Trails Master Naturalist Chapter during a work day on the Parkville butterfly garden.



St. Joseph Loess Hills Chapter plants trees along Highway 36.

Phase two is getting underway this fall with tree plantings from Cameron to Brookfield, with the final phase from Brookfield to Hannibal to be completed in 2018. A project of this size and scope also includes many partners, including tree seedlings from the George O. White State Forest Nursery and help with mowing and site selection from the Missouri Department of Transportation. Mary Jo Ostberg, who was part of the first Master Naturalist class in 2011, has been with the project from the very beginning. While there are still years of tree planting work ahead, she hopes it will be a project remembered for generations.



"This was a project we could all do together. Our grandchildren will drive down that road and see all the trees we planted," said Ostenberg. "I hope we can leave a legacy to see what the Master Naturalist chapter is all about."

In the end, the greatest legacy for master naturalists in Missouri is their ability to work together, their passion for conservation, and their gift for educating others about why it matters. It's also their open invitation for others to join them on this journey.

"We need to bring nature back into our lives. It doesn't matter if you are 2 or 92. Nature needs you," said Nemecek. ▲

Heather Feeler, communications manager with the Department, loves exploring the Missouri outdoors, including hiking and fishing with her family.



WHERE DID THAT FISH COME FROM?

**High-tech
microchemistry
reveals life histories,
migration routes, and opportunities
to improve management**

BY BONNIE CHASTEEN | PHOTOGRAPHS BY DAVID STONNER

LANDING A LUNKER FROM ONE OF MISSOURI'S BIG RIVERS CAN MAKE YOU wonder where your catch has been all its life. Department resource scientists wonder this, too. After all, knowing a fish's origin and migration history can help agencies know when and where to adjust management — across the state, throughout the region, and even internationally. For a long time, fisheries biologists relied on complicated processes, angler cooperation, and a lot of luck to learn the ranges and movements of fish. Now, a new chemistry technique allows Department resource scientists like Dr. Quinton Phelps to use a fish's own anatomy to learn where it hatched, and where and how far it traveled in its life.



How Big Are Big Rivers?

Phelps and Resource Scientist Sara Tripp work with Supervisor Dave Herzog and the rest of the research team at the Big Rivers and Wetlands Field Station in Jackson. They operate out of a 1950s ranch-style house, but their work is quite literally cutting edge. The dining room serves as a computer lab, and the basement stores racks of carefully labeled samples, as well as a precision saw, which they use to prepare bone samples for analysis. Their findings help agencies and other managers, such as the Army Corps of Engineers and the U.S. Fish and Wildlife Service, better understand the workings of big river and wetlands systems within the state's borders and beyond.

"We're discovering that big rivers are even bigger than we thought," Herzog said.

In fact, the Mississippi River Basin and its tributaries are part of a migration route that, for some kinds of fish like the American eel, can stretch as far as the Sargasso Sea, south of Bermuda.

Fish migrations, however, are invisible to us. "It's easy to see the migration patterns of butterflies, birds, and mammals," Tripp said. "These animals travel where we can watch them — in the air and on land. When we look at a river or an ocean, we see water but not the animals that live and migrate within it.

"We don't know that there isn't a monarch in the fish world," Tripp said.

Swimways Are Like Flyways

Her comment reminds us that the monarch butterfly's recent decline has inspired agencies, nonprofits, local communities, and garden clubs all along the monarch's migration route from Mexico to Canada to plant milkweeds and other native wildflowers to sustain them throughout their annual migrations.

The team's work with microchemistry, telemetry, and other techniques can help managers do the same for migrating fish, such as the endangered pallid sturgeon.

"Our efforts can guide managers to make adjustments at sensitive places and moments in a fish's life cycle — breeding, hatching, and migration," Herzog said.

Trace Elements Tell a Story

As a tracking tool, microchemistry is possible for two reasons: different environments have different trace elements and isotope signatures, and animals record these signatures in their bones. Fish, mammals (including humans), and birds absorb and store elements from every place where they eat and drink. As Herzog said, "You've heard, 'you are what you eat?' Turns out another adage may be true: you are a product of your environment."

Our bones store the chemical timelines of the places where we have lived. Much like growth rings can reveal a tree's age and environmental conditions during each year of its life, an animal's bone can reveal what elements it encountered and when and where it encountered them.

"Boiled down, microchemistry is using trace elements to help us tell a story about an organism or group of organisms," Phelps said.



Tracing Swimway Connections

Just as migratory birds follow flyways, migratory fish follow swimways. The American eel is an astonishing example. Bred and born deep in the Sargasso Sea south of Bermuda, adult American eels range into estuaries along the east coast and Gulf of Mexico. Predominantly only the females migrate up into freshwater streams. Why? "Probably to find the nutrition they need to fuel migration back to their breeding grounds," Tripp said. "We really don't understand why a lot of animals do what we observe them doing. That's why we use tools like microchemistry and telemetry to help measure the extent of their range and quantify their behavior."

How the Process Works

Using simple drawings and symbols to explain complicated terms, Phelps demonstrates how the microchemistry process works.

We Know the Basin's Signature

Phelps sketches a rough map of the Mississippi River Basin, showing where the Missouri, the Illinois, and the Ohio rivers flow in. Before Phelps' team can correlate a fish's bone chemistry to its environment, they need to have an accurate elemental map of North American rivers. "Our partners have been collecting water samples from the entire basin for the last 15 years. This mapping gives us space-and-time insight into chemistry throughout the whole basin." For example, they know the upper

Big Rivers and Wetlands Field Station team member Quinton Phelps explains how a fish's bones absorb and preserve a record of the water chemistry it encounters throughout its life.

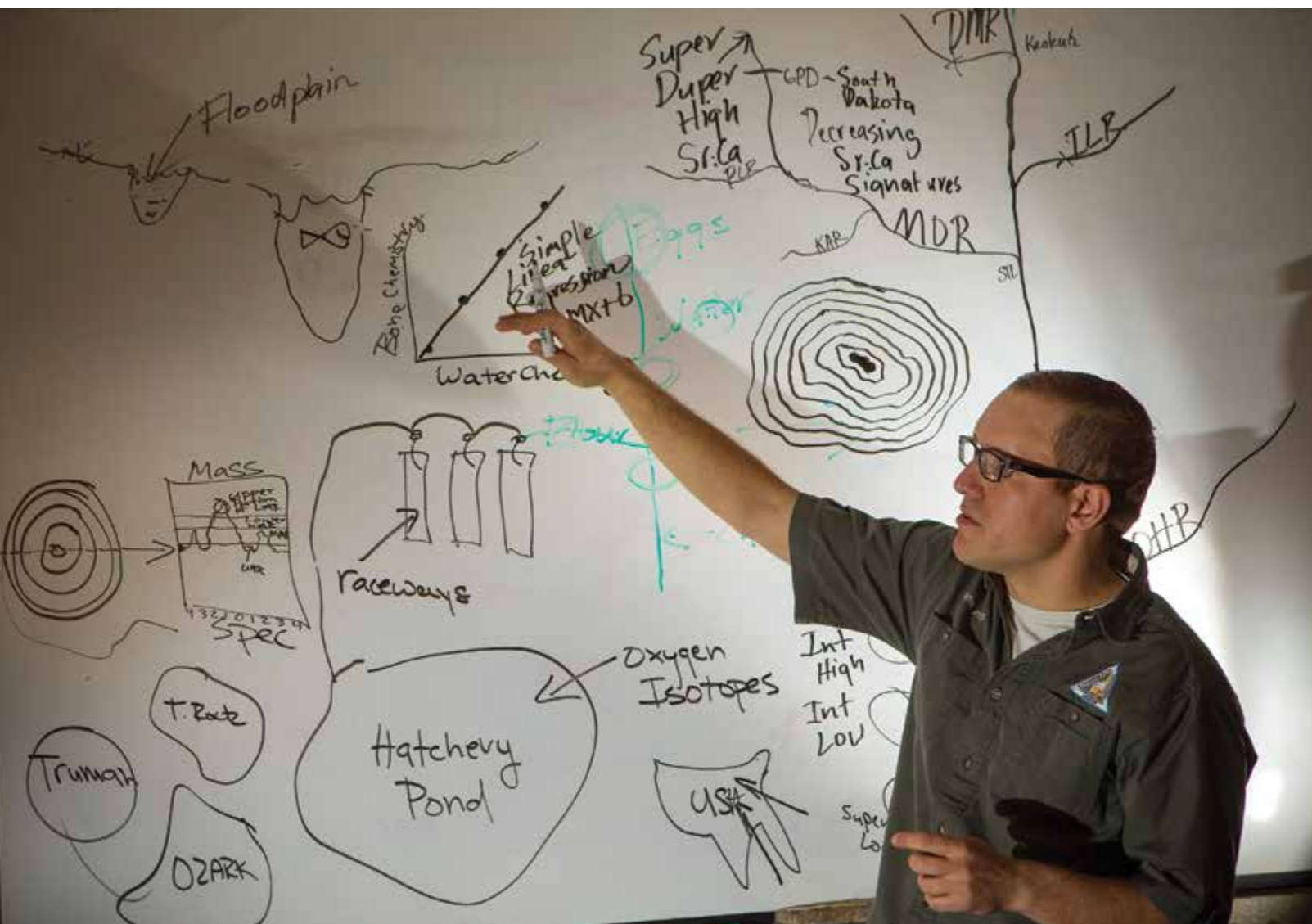
Missouri River has a high strontium-to-calcium ratio that decreases as it approaches the Mississippi River.

Fish Eat Yummy Isotopes

Phelps draws a little cartoon of a baby fish in a pond. He notes that non-flowing disconnected river sloughs can harbor high concentrations of nutrients marked with isotopes of common elements. When young fish are exposed to uniquely marked isotope environments, their bones store these markers. Because bone rings develop during cycles of warm and cold, the rings can record daily temperature changes too, providing scientists with even more information about changes in fishes' local environments.

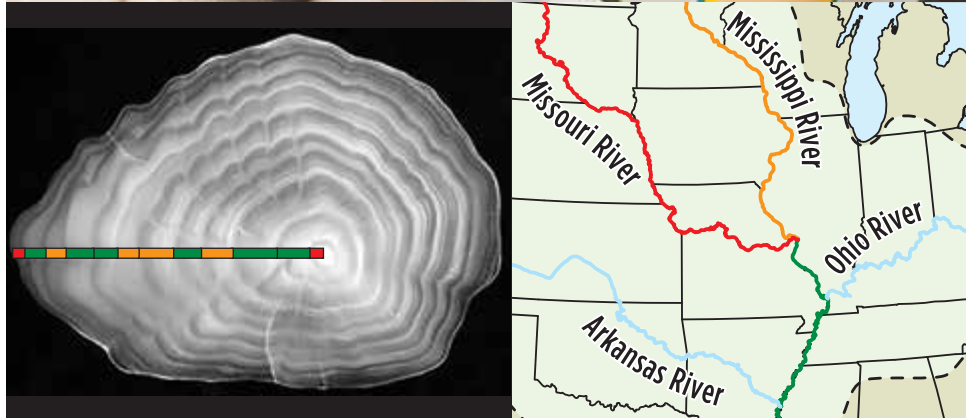
We Pick a Bone

Phelps draws a cross-section of an otolith, also known as an "ear stone." It looks a lot like a tree "cookie," with visible growth rings. "Otoliths are paired structures made of calcium carbonate and other trace metals such as strontium, barium, and magnesium," he said.



Seth Love, a Southeast Missouri State University graduate student, uses a precision saw to carefully cut a sample from a fish's fin ray. He will then prepare the bone sample to send to the spectrometry lab for analysis.

Water chemistry varies between regions, and fish absorb the chemical signatures of the waters they swim through. This example shows how spectrometry reveals the record of a fish's travels throughout its life. Red at the center shows the fish hatched in the lower Missouri River. Green shows the fish migrated to the lower Mississippi River, and orange shows it moved into the upper Mississippi River. Red on the outer ring shows the fish returned to the Missouri River, most likely to spawn. Knowing where and when fish travel can help agencies cooperate to improve habitat or control invasive species.



Located in a fish's head, ear stones help it hear and maintain balance. These structures form when the fish hatches and continue to grow, layer by layer, throughout the fish's life. Fin rays are another bony part where fish store records of the chemical components in proportion to the environment in which they live.

"Otoliths and fin rays are perpetual records of where fish have been and when they were there," Phelps said. "If we cut across these bones, you can see the growth rings, which are called annuli." Just like trees, which put on new growth rings every year, fish bones make a new ring that records a fish's movement into different waters throughout the year.

"Put simply," he said, "the environment a fish inhabits at any particular time determines the chemical makeup of each ring."

We Prep the Sample

"So," Phelps said, "now that we know the properties of otoliths and water chemistry — and the synergy between them — what's the process of figuring out where the fish came from?" To explore the answer to this question, we go downstairs to the basement. This is where a team of Southeast Missouri State University graduate students help Phelps organize and prepare samples for analysis.

He introduces me to Seth Love, who carefully cuts a fin ray from a sample fish. "The advantage of using the fin ray instead of the otoliths is that I can take a sample without sacrificing the fish."

Then Love uses a small precision saw to cut a thin wafer of bone. The next step is to dry and polish this sample, which takes several hours.

Meanwhile ...

We Fire Up the Old Plasma Mass Spectrometer

Not quite. Turns out a plasma mass spectrometer is an expensive piece of equipment, one that you wouldn't keep in the basement of an old house.

"We contract with a specialized lab to process the samples for analysis," Herzog said.

There, the team uses a laser to burn a section across the sample and record the location of each annulus or growth ring. Then they examine the chemical composition of the particles produced at each ring on the sample. Using the sample's chemical data coupled with the chemistry data from the waters the fish inhabited or may have inhabited in the past, they can determine the frequency and timing of a fish's movement between chemically distinct locations.

"In the end, fish microchemistry offers a reliable way to track the movement patterns of fish in large bodies of water," Phelps said.

This tube holds a young-of-the-year black carp found earlier this year. The field station team will use plasma mass spectrometry and other methods to explore ways to control this destructive invasive fish throughout the Mississippi River Basin swimway.



A Holy Grail of Information

After his presentation, Phelps shows me a clear plastic tube. He cradles it like it's a bar of gold. "This," he said, "is the Holy Grail."

The tube is a vessel, yes, but there's a dead fish in it. Wasn't the Holy Grail supposed to be flowing with good things? Eternal youth and food in abundance? I suppose you could eat the fish, but ... "What do you mean?" I ask.

"It's a young-of-the-year black carp. It wasn't supposed to be here. But last month we found it."

That was January 2016. Before then, scientists thought black carp, an Asian species imported to control snails in freshwater fish farms, couldn't breed in the wild. Unfortunately, Phelps' Holy Grail specimen proved this assumption wrong. Unfortunate because black carp are death on native freshwater mussels. Sad because the Mississippi River Basin has the most diverse freshwater mussel population in the world. Sadder still because 75 percent of the region's freshwater mussel species are threatened or endangered, and proof of a breeding population of mussel-murdering black carp could spell doom for them.

Herzog explains why his team views this discovery as

the Holy Grail. "It helps us act sooner rather than later. We can use microchemistry to find out where these fish are breeding. Understanding their early life history could help us prevent them from becoming adults. How do they spawn? How do they survive? Our role is to explore and propose early solutions."

Microchemistry gives scientists a way to link a fish's movement patterns to specific locations it uses for spawning, feeding, and refuge throughout its life. Using this tool, scientists have learned that fish move freely among rivers and across many state boundaries, each regulated by different agencies. In order to effectively manage or restore these highly mobile fish populations, agencies are challenged to begin or increase their interjurisdictional management.

Microchemistry has endless potential in fisheries management, both in state and across borders, and it will eventually be a common choice in the toolbox of every fisheries biologist. ▲

Bonnie Chasteen is the Missouri Conservationist's associate editor. She enjoys visiting and talking with field staff about their cool work whenever she gets the chance.



More About the Big Rivers and Wetlands Field Station

"I'm very proud we are part of such an amazing river-monitoring program," Herzog said.

The Big Rivers and Wetlands Field Station (BRWFS) was established on Jan. 2, 1991, the last field station added to the Upper Mississippi River Restoration Program. It is the only field station located on the open reach of the Upper Mississippi River.

BRWFS staff is involved in a variety of activities including research, planning, and education programs. Their primary responsibility is to carry out the Missouri Department of Conservation's mission as it relates to the state's large rivers. Learn more about BRWFS work and accomplishments at on.doi.gov/1YFBrVS.

Yellow-Bellied Racer

MANY PEOPLE HAVE a love-hate relationship with snakes. They capture our imaginations, yet we instinctually fear them. Some people have such a fear of snakes they may avoid outdoor activities, while others kill every snake they encounter.

We tend to fear things we don't know and often misunderstand. As a nature photographer, I have a front row seat to nature and have developed a deeper appreciation for snakes.

Several years ago, I was introduced to snakes, and I began to be fascinated by their complexity and agility. But never did I imagine I would be just a few inches away from a snake egg that was about to hatch. My heart raced, not from fear, but excitement. Right before my eyes, a small baby yellow-bellied racer took a look at the world for the first time, and I was there to observe it.

As the snake inched out of its egg, I was fascinated to watch a new life transform right before my eyes. Once hatched, the newly emerged snake immediately searched for protection under thick cover of an old log.

Snakes are an important part of our ecosystem. They help control populations of rodents and other pests. In Missouri, there are 47 native snakes, and only five of them are categorized as venomous. The yellow-bellied racer (*Coluber constrictor mormon*) is a nonvenomous snake in the order Squamata. Adults look unique because of their beautiful, uniform coloring and large eyes. However, because racers are born with rusty brown blotches on their back and sides, juveniles are often confused with other species of snakes, such as the garter snake or the rattlesnake.

The name racer is no accident since these snakes are built for speed. Racers use their excellent vision and speed to hunt during the day. Not only are racers good on the ground, they are also good climbers and are occasionally found hunting high in the bushes.

Yellow-bellied racers use their excellent eyesight to hunt a variety of prey. Racers attack prey with their teeth and wrestle it down before swallowing it as quickly as possible. Young racers mainly munch on insects like grasshoppers, crickets, and caterpillars, and adults often tackle larger prey like mice, voles, small reptiles, and frogs.

Racers are active during daytime from March through November, living in native prairies, grasslands, pastures, brushy areas, and along the edges of forests. In spring and fall, they are often found on rocky, wooded, south-facing hillsides, and in winter, they stay in caves or mammal burrows in open habitat.

Courtship and mating occurs soon after these snakes emerge from overwintering retreats, usually in early April. Egg laying usually occurs in mid-June to late July. The female lays eight to 21 eggs under logs or in abandoned burrows. The eggs hatch in two to three months.

Try to get to know snakes, their natural history and their role in nature, and then you might be able to overcome your fear and appreciate them.

—Story and photograph by Noppadol Paothong

📷 100mm macro lens • f/16 • 1/250 sec • ISO 160



We help people discover nature through our online Field Guide.

Visit mdc.mo.gov/field-guide to learn more about Missouri's plants and animals.



Manito Lake Conservation Area

Looking for a fall fishing and birding spot? This area on the Moniteau-Morgan county line features a 77-acre lake and 851 acres of old field, woodland, and forest.

VISITORS TO MANITO Lake Conservation Area will find an inviting 77-acre lake with bass, redear sunfish, bluegill, crappie, and catfish. The area features a boat launch, shoreline fishing, fishing jetties, fishing platform, disabled-accessible parking, and restrooms. A water control structure allows for lake water-level management that is timed to benefit fish spawning seasons, create mudflats for shorebirds, and promote varying depths of shoreline vegetation desirable for fish, migratory water birds, and waterfowl.

Field trails provide visitors walk-in access to interior portions of the area. The calls of the bobwhite quail, Bell's vireo, dickcissel, eastern meadowlark, American goldfinch, field sparrow, grasshopper sparrow, or Henslow's sparrow may catch a birder's ear.

Seasonal calls of the spring peeper, chorus frog, cricket frog, or American toad may also announce hidden fishless ponds worth a summer hunt for bullfrogs. Rabbit and quail hunting are long traditions at Manito Lake, where statewide regulations apply. Deer and turkey hunting are worth considering, and waterfowl hunting on the lake can be seasonally good.

Two lake drainages add a wooded, shrubby fringe that borders predominately open grasslands, prairie remnant, and early succession, old-field habitats. Prairie remnants harbor seasonal blooms of blazing star, catclaw sensitive brier, butterfly milkweed, and prairie dock. Shortly after the property's acquisition in 1981, warm-season grasses and wildflowers were planted for



📷 70–200mm lens • f/5.6 • 1/60 sec • ISO 800 | by Noppadol Paothong

upland and grassland wildlife. The area's grasslands are managed primarily through prescribed burning and rotations of haying and rest. Woodlands border the uplands adjacent to the lake. Recently completed woodland thinning benefits wildlife and sustains woodland health.

The word "Manito" is derived from "Manitou," an Algonquian word that means "great spirit." It is also a variation on Moniteau, the name of the county. On the east side of the area, a carved wooden marker notes a homestead bur oak planted by pioneer Andrew Wolf in 1874.

—Kent Korthas, area manager



Manito Lake Conservation Area

Recreation Opportunities: Hunting, fishing, birding, wildlife viewing

Unique Features: 77-acre lake; fishing jetties; accessible parking lot, restrooms, and fishing jetty; prairie remnants

For More Information: Call 660-530-5500 or visit mdc.mo.gov/a8101



MDC DISCOVER nature

To find more events near you, call your regional office (phone numbers on Page 3), or visit mdc.mo.gov and choose your region.

HOWLOWEEN SPECIAL EVENT

OCT. 14 • FRIDAY • 6–9 P.M.

*Kansas City Region, Anita B. Gorman
Conservation Discovery Center, 4750 Troost
Ave., Kansas City, MO 64110*

*No registration required, call 816-759-7300
for more information*

All ages, families

Kids will have a howling good time exploring nature stations like Track or Treat, the Bone Yard, and much more.

SPECIAL EVENT: MISSOURI OWLS

OCT. 14 • FRIDAY • 6–8:30 P.M.

*Central Region, Runge Conservation
Nature Center, 330 Commerce Drive,
Jefferson City, MO 65109*

*No registration required, call 573-526-5544
for more information*

All ages

How do owls see, hear, hunt, and eat? Find the answers to these curious questions when you join us at our special event. This event will feature live owls from Missouri University Raptor Rehabilitation program.



Great
horned owl

DUTCH OVEN COOKING

OCT. 22 • SATURDAY • 2–6 P.M.

*Northwest Region, Honey Creek
Conservation Area, 701 James McCarthy
Drive, St. Joseph, MO 64507*

*No registration required, call 816-271-3100
for more information*

*All ages, 12 and younger must be
accompanied by an adult*

Participants will help prepare and cook many different dishes. You will learn how to care for and clean Dutch ovens, and how to use charcoal as a heating source.

FALL FESTIVAL

OCT. 22 • SATURDAY • 4–8 P.M.

*Southeast Region, Cape Girardeau
Conservation Nature Center, 2289 County
Park Drive, Cape Girardeau, MO 63701*

*No registration required, call 573-290-5218
for more information*

All ages, families

Join us to explore the world of nighttime flyers. Meet magnificent owls in our live bird presentations at 4:30, 5:30, and 6:30. Take a stroll down a trail on one of our naturalist-led hikes to discover more about whooo's awake at night. Sit outside, and enjoy a fire and a few fall treats, or come in for crafts.



IDEAS
FOR
FAMILY
FUN

INTO THE WOODS WITH RED RIDING HOOD

OCT. 27 • THURSDAY

OR OCT. 28 • FRIDAY • 6:30–9:30 P.M.

*Southwest Region, Springfield Conservation
Nature Center, 4601 S. Nature Center Way,
Springfield, MO 65804*

*No registration required, call 417-888-4237
for more information*

All ages

Learn how nighttime animals survive in the dark through fun guided hikes that are insightful, not frightful. Enjoy activities inside while waiting for a hike.

BUSY AS A BEAVER

OCT. 29 • SATURDAY • 9:30–11 A.M.

*St. Louis Region, St. Louis Regional Office,
2360 Hwy D, St. Charles, MO 63304*

*Registration required, call 636-441-4554
beginning Oct. 14*

Ages 7–12

Beavers have made quite an impact on Missouri, and we have made one on them as well. Come learn all about these interesting critters.

DISCOVER NATURE: DEER PROCESSING CLASS

NOV. 1 • TUESDAY • 6–9 P.M.

*Northeast Region, Northeast Regional Office
3500 South Baltimore St.,
Kirksville, MO 65109*

Registration required, call 660-785-2420

*Ages 14 years and older; if younger than 18,
must be accompanied by an adult*

Learn how to process a deer, from field to freezer.



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I Am Conservation

"Two of my passions are prairie restoration and wildlife habitat," said Tom McCutcheon, with his wife Phebe on part of their land in Saline County. Tom said the original 160 acres has been in his family since 1905. He and Phebe purchased an additional 507 acres 20 years ago. Tom said one tract of 150 acres is managed for grasslands, while another is managed for timber. The rest of the farm is in agriculture and livestock production. "I love the land," said Tom, "and I spend a lot of time working on it, trying to control any erosion that might occur, and to get as good a stand of prairie grasses and forbs as I can get." When it comes to his woods, Tom said, "What I'm really trying to do is control invasives and get a mature hardwood forest with a large variety of trees." Tom and Phebe not only exercise their passions for wildlife habitat on their own land, but they give back to the community by being active members of the Boone's Lick Chapter of Missouri Master Naturalist, Quail Forever, Missouri Prairie Foundation, the National Wildlife Federation, and the Arbor Day Foundation. As master naturalists, Tom and Phebe help the Missouri Department of Conservation gather prairie seeds that are milled and sown on other Department lands. "They are trying to do the same thing I am doing — reestablish prairie." —*photograph by Noppadol Paothong*